ASSESSING ELECTRICAL SERVICE CAPACITY

A BUILDING OWNER'S GUIDE TO DETERMINING ELECTRICAL SERVICE CAPACITY

When assessing the electrical service capacity of a building, project developers need to design systems that accommodate diverse and varying building loads to ensure optimal performance and prevent safety hazards associated with overloaded electric systems.[1]

This involves analyzing peak demand scenarios, accounting for future electric load growth and integrating advanced energy management systems. A well-designed system with adequate electrical capacity will improve the building's maintenance and operations as well as reduce long-term operating costs.

This document is a guide to assessing existing electrical capacity and whether new loads will fall within the service capacity.

WHAT IS ELECTRICAL CAPACITY?

Electricity is distributed in Ontario through high-voltage power lines. Voltage is stepped down by transformers before being delivered to buildings. For residential homes, 120/240 volts (V) is common and for commercial, institutional and industrial buildings, 120/208V and 347/600V are used.

Electrical equipment operates at different voltages. For example, home appliances like ovens and clothes dryers operate at 240V, whereas lighting and power outlets need only 120V. Electrical capacity is expressed in amps (A). The total power (P) available in a building at a given time is expressed in simple terms as P = V x A.

When existing buildings are considering new electrical loads, the electrical capacity at the service entrance must be assessed to ensure safety, reliability and efficiency. Electric vehicle (EV) charging stations add new electrical load to the building. Heat pump installations can increase electrical load and there may not be capacity for these new loads based on the original design.

[1] Electrical Safety Authority: esasafe.com/fire-services/

HOW TO ASSESS YOUR BUILDING'S EXISTING ELECTRICAL SERVICE CAPACITY

Electrical capacity assessment → New load calculations → Opting for efficiency → Electrical load controls

Figure 1: Steps to ensure new loads are well accommodated.

There are several options available to assess the electrical service capacity in existing buildings:

1. Locate your main electrical panel. Check if the main disconnect switch has a number printed on it, which will indicate the capacity in amps. This is usually the easiest way to find your service size.
2. Check for amps ratings on the main electrical panel. Usually, these labels are on the inside of the panel door and may have been placed there by manufacturers, electricians or inspectors.
3. Check the electricity meter on the exterior of the building to see if a rating is printed or attached. It might have a code such as CL200, which would indicate 200 amps.
4. In some buildings, locating the main electrical panel or the meter may be difficult. There may be multiple submeters or a lack of documentation. In these cases, have an electrician assess the existing electrical service capacity.

HOW TO ASSESS THE IMPACT OF NEW ELECTRICAL LOADS

Building owners should work with licensed electricians to ensure that new electrical loads fit within the installed service capacity. Licensed electricians will perform an assessment of the service capacity available and determine any additional capacity required to meet new loads.

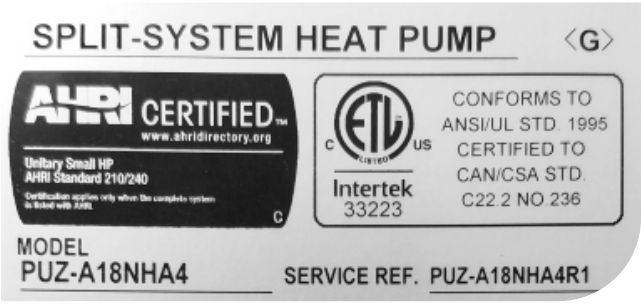

Figure 2: Example of a heat pump nameplate.

Questions to ask your electrician:

1. What is the total capacity supplied to the building?
2. How much of the existing capacity is currently unused?

In general, there are two steps for assessing electrical capacity:

1. **Determine the total electrical demand**
   - **a.** Accurately calculate the total electrical power that will be used by all appliances, devices and equipment at a given time.
   - **b.** It is crucial to consider future potential energy needs during this step, such as new EV charging infrastructure and new heating and cooling equipment, such as heat pumps.
   - **c.** The ***Ontario Electrical Safety Code*** prescribes that load demand must not exceed 80 percent of the service rating. If the installation of new electrical equipment could exceed this load, a larger electrical service capacity is required.
2. **Determine required service capacity**
   - **a.** Typically, standard electrical capacities are 100, 200 or 400 amps for residential buildings, while larger commercial and industrial buildings can have larger capacities.
   - **b.** A good rule of thumb is to select a standard service capacity size just above the building's electrica demand.

HOW TO MAKE A SERVICE UPGRADE REQUEST TO YOUR LOCAL ELECTRICAL UTILITY

There are five basic steps to making a request:

1. Submit a general inquiry/application for the service request.
   - This includes project information, contractor details, drawings or equipment specification sheets.
2. Your local electrical utility, also known as a local distribution company (LDC), will review your submission.
   - The LDC may send a representative to conduct an on-site visit to evaluate the building.
3. Hire a licensed electrical contractor (LEC) and obtain a permit. Licensed electrical contractors will obtain permits on your behalf.

   Protect yourself and your building by always using an LEC to perform any electrical work. For additional guidance on finding a an LEC, visit Electrical Safety Authority.
4. Complete the project installation.
5. Schedule a final inspection.
   - Upon completion of the upgrade, the electrical work will be reviewed to ensure it meets the requirements of the ***Ontario Electrical Safety Code***, and ESA will issue a Certificate of Acceptance to your LEC. Request a copy of the certificate for your records.

Key questions to ask your LDC:

1. **How much capacity is available on the electrical system to increase supply to the building?** The LDC will be able to determine the remaining available electrical capacity at the nearest transformer or substation.
2. **What is the associated cost of the upgrade?** The cost of a service upgrade may vary depending on the scope of work. This is in addition to costs for an electrician to complete the work inside the building.
3. **What is the anticipated timeline for the upgrade?**

Please note that each LDC may have a slightly different series of steps for service upgrade requests.

SMART SOLUTIONS FOR MANAGING NEW OR INCREASED LOADS

There are many solutions on the market today that enable switching to electrical heating systems and installing EV charging stations without overloading the electrical capacity of a building. For example:

1 Energy efficiency

Improvements to the building enclosure can reduce heat loss and therefore the new load from a heat pump. Other electric loads can be reduced through energy-efficiency upgrades to lighting, controls and related equipment. Save on Energy programs offer rebates of up to 50 percent for eligible energy-efficiency upgrades.

2 Innovative technology

Cold climate heat pumps can supply a building's heat load at lower outdoor air temperatures, while including a hybrid option for extreme cold provides flexibility to select a smaller capacity heat pump.

3 Smart panels/breakers

Smart load switches can be installed in EV charging stations. These switches continuously measure service currents and adapt the power supply to the EV charging station to prevent overload.

Once adequate electrical service capacity has been established for your building, the smart solutions mentioned above, such as heat pumps and EV chargers, can be integrated.

Before pursuing such capital-intensive upgrades, we highly recommended that owners consider optimizing their building by increasing energy efficiency and minimizing energy losses. By prioritizing lower-cost optimization measures, owners can maximize the long-term benefits of their high-performance systems. Visit Save on Energy to access resources and tools that provide additional information on energy-efficiency and efficient electrification project planning.